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Date July 16, 1999

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE  
BEFORE THE BOARD OF PATENT APPEALS AND INTERFERENCES

In re Application of:  
Mannava, et al.

Serial No: 08/719,341

Filed: September 25, 1996

For: LASER SHOCK PEENED GAS TURBINE  
ENGINE COMPRESSOR AIRFOIL EDGES

Group Art Unit: 3745

Examiner: C. Verdier

Assistant Commissioner for Patents  
Washington, D.C. 20231

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BRIEF OF APPELLANTS

This is an Appeal from the rejection of the Examiner  
dated February 22, 1999 rejecting Claims 1-20. This Brief is  
accompanied by the requisite fee set forth in §1.17(f).

REAL PARTY IN INTEREST

The real party in interest in this Appeal is the  
Assignee, General Electric Company, One River Road,  
Schenectady, New York 12345.

EXTENT OF ASSIGNEE'S INTEREST

The extent of the interest in this invention that the  
assignee owns is the whole of this invention.

RECORDAL OF ASSIGNMENT IN USPTO

The assignment was recorded on March 6, 1995, Reel 7393,  
Frames 0641, 0642, and 0643.

11/02/2000 LASHING 08719341  
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RELATED APPEALS AND INTERFERENCES

At this time, there are no interferences and no related Appeals to this case known to the Appellants, the Appellants' legal representative, or the assignee which may or will directly affect or be directly affected by or may have a bearing on the Board's decision in this pending Appeal.

STATUS OF CLAIMS (37 C.F.R. 1.92(c)(1))

This Application is a Continuation Application of an original parent U.S. Patent Application 08/399,285 filed March 6, 1995. This Application was filed with twenty (20) claims of which four (4) were independent (Claims 1, 6, 11, and 16).

The Examiner issued an Office Action dated as mailed February 22, 1999 rejecting Claims 1-20 under 35 U.S.C. §103(a), from which the Appellants now Appeal.

The status of the claims as set out in the Office Action dated as mailed February 22, 1999 was and is as follows:

allowed claims -- none  
claims objected to -- none  
claims rejected -- 1-20

STATUS OF AMENDMENTS (37 C.F.R. 1.192(c)(2))

Claim 17 is the only remaining unentered claim, it was submitted in the Applicants' response filed on August 10, 1998 and the Examiner replied that the Proposed Amendment would be entered in his Advisory Action dated as mailed September 9, 1998 and numbered as Paper No. 24.

SUMMARY OF THE INVENTION (37 C.F.R. 1.192(c)(3))

The Appellants' invention is a gas turbine engine component and, in a more particular embodiment, a compressor blade (8) having a metallic compressor airfoil (34) with a leading edge (LE) and a trailing edge (TE) and a pressure side (46) and a suction side (48). At least a first laser shock

peened surface (54) is on a first side of the airfoil and extends radially along at least a portion (50) of the leading edge and chordwise from the leading edge. A first region (56) having deep compressive residual stresses imparted by laser shock peening (LSP) extends into the airfoil from the laser shock peened surface wherein the deep compressive residual stresses are formed with focused laser beam spots (240) on said laser shock peened surface. The laser beam spots having a power density in a range between 100 and 200 joules per square centimeter.

A more particular embodiment of the invention has the first laser shock peened surface located along the pressure side of said leading edge. A second laser shock peened surface is located along the suction side of the leading edge and extends radially along at least a portion of the leading edge and chordwise from the leading edge. A second region having deep compressive residual stresses imparted by laser shock peening (LSP) extends into the airfoil from the second laser shock peened surface and are formed with focused laser beam spots on the laser shock peened surface. The laser beam spots have a power density in a range between 100 and 200 joules per square centimeter.

The laser shock peened regions are preferably formed by simultaneously laser shock peening both sides of the airfoil. Other embodiments of the invention include laser shock peened surfaces on the trailing edge which are formed in a similar manner as those on the leading edges. The compressor blade may be a repaired compressor blade.

ISSUES (37 C.F.R. 1.192(c)(4))

**ISSUE 1.** Whether Claims 1-20 are patentable under 35 U.S.C. §103(a) over Mannava 5,591,009, in view of Neal et al. 4,426,867 and Mallozzi 3,850,698.

**ISSUE 2.** Whether Claims 1, 2, 3, 4, 5, 6, 7, 8, 11, 12, 13, 16, 17, and 18 are patentable under the judicially created doctrine of obviousness-type double patenting as being unpatentable over Claims 1, 1, 3, 1, 3, 1, 1, 3, 1, 1, 3, 1, 1, and 3 of U.S. Patent No. 5,591,009 in view of Neal et al. 4,426,867 and Mallozzi 3,850,698.

**ISSUE 3.** Whether Claims 9-10, 14-15, and 19-20 are patentable under the judicially created doctrine of obviousness-type double patenting as being unpatentable over Claims 4, 4, 4, 4, 4, and 4, respectively, of U.S. Patent No. 5,591,009 in view of Neal et al. 4,426,867 and Mallozzi 3,850,698.

**ISSUE 4.** Whether Claims 1-20 are patentable under the judicially created doctrine of obviousness-type double patenting as being unpatentable over Claims 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, and 1, respectively, of U.S. Patent No. 5,531,570 since the claims, if allowed, would improperly extend the "right to exclude" already granted in the patent.

GROUPING OF CLAIMS (37 C.F.R. 1.192(c)(5))

As to the rejections applied against Claims 1-20 as unpatentable under 35 U.S.C. §103(a) over Mannava 5,591,009, in view of Neal et al. 4,426,867 and Mallozzi 3,850,698. It is Appellants' intention that the rejected Claims 1-20 stand or fall together in a single group.

As to the rejections applied against Claims 1, 2, 3, 4, 5, 6, 7, 8, 11, 12, 13, 16, 17, and 18 as being unpatentable under the judicially created doctrine of obviousness-type double patenting over Claims 1, 1, 3, 1, 3, 1, 1, 3, 1, 1, 3, 1, 1, and 3 of U.S. Patent No. 5,591,009 in view of Neal et al. 4,426,867 and Mallozzi 3,850,698, it is Appellants'

intention that the rejected Claims 1, 2, 3, 4, 5, 6, 7, 8, 11, 12, 13, 16, 17, and 18 stand or fall together in second single group.

As to the rejections applied against Claims 9-10, 14-15, and 19-20 as being unpatentable under the judicially created doctrine of obviousness-type double patenting over Claims 4, 4, 4, 4, 4, and 4, respectively, of U.S. Patent No. 5,591,009 in view of Neal et al. 4,426,867 and Mallozzi 3,850,698, it is Appellants' intention that the rejected Claims 9-10, 14-15, and 19-20 stand or fall together in third single group.

As to the rejections applied against Claims 1-20 as being unpatentable under the judicially created doctrine of obviousness-type double over Claims 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, and 1, respectively, of U.S. Patent No. 5,531,570 since the claims, if allowed, would improperly extend the "right to exclude" already granted in the patent, it is Appellants' intention that the rejected Claims 1-20 stand or fall together in fourth single group.

ARGUMENT (37 C.F.R. 1.192(c)(6))

**ISSUE 1 -- Whether Claims 1-20 are patentable under 35 U.S.C. §103(a) over Mannava 5,591,009, in view of Neal et al. 4,426,867 and Mallozzi 3,850,698.**

There is an absence of features of the presently claimed invention in the prior art and a lack of even a suggestion in the prior art to make a §103 combination of prior art as done by the Examiner in these rejections. The Appellants filed a declaration under 37 CFR 1.131 on February 4, 1999 to overcome the Mannava 5,591,009 reference. The Examiner has considered this declaration but deemed it ineffective to overcome the Mannava 5,591,009 reference because the Mannava 5,591,009 patent is claiming the same patentable invention wherein the

same patentable invention is defined in MPEP 715.05 as when the invention is considered obvious under 35 USC 103.

Claim 1 of the Mannava 5,591,009 patent, from which the remaining Claims 2-4 depend, claims a fan blade while the Appealed Claims all include a compressor airfoil which is different than an airfoil found in a fan blade. Claim 1 of the Mannava 5,591,009 patent, also includes the limitation of a laser shock peened surfaces extending radially along a portion of and chordwise from the said leading edge wherein the portion is centered about an intersection of the leading edge and a predetermined nodal line of the blade.

The Specification and Appealed Claims of the present Application make no mention of the invention having the portion being centered about an intersection of the leading edge and a predetermined nodal line of the blade. Furthermore, a compressor blade and compressor airfoil is very different from a fan blade as argued by the Appellants during prosecution of the present Application. The parent Application of the present Application under Appeal was filed on March 6, 1995 and the Mannava 5,591,009 patent was filed on January 17 1995. The Appellants have filed several Declarations under 37 C.F.R. 1.131(b) proving invention of the present invention before the filing and reference date of the Mannava 5,591,009 patent. The declaration filed on February 4, 1999 under 37 CFR 1.131 by the Appellants appears to be have overcome the Mannava '009 reference. However, the Examiner stated in his rejection in the Office Action dated as mailed February 22, 1999 that "The declaration filed on February 4, 1999 under 37 CFR 1.131 has been considered but is ineffective to overcome the Mannava 5,591,009 reference." The Examiner stated that this Declaration appears to be ineffective not because the requisite facts were not shown but because a "declaration is inappropriate under 37 CFR 1. 131(a) when the patent is claiming the same patentable invention".

The Appellants have clearly shown that the claims under

Appeal do not claim the same patentable invention even within the definition of same patentable invention in MPEP 715.05 when the invention is considered obvious under 35 USC 103. The Examiner has ignored the differences and has failed to point out any evidence that a fan airfoil is the same or considered to be the same as a compressor airfoil. He has also ignored the other features found in the claims of the Mannava 5,591,009 reference and not found in the claims presently under Appeal.

The Examiner rejected Claims 1-20 under 35 U.S.C. 103(a) as being unpatentable over Mannava '009 in view of Neal and Mallozzi 3,850,698. The Examiner reasoned that "Mannava '009 discloses a repaired laser shock peened gas turbine engine component substantially as claimed, but does not disclose that the component is a compressor blade, and does not disclose that the laser shock peening spots are at a power density of 100-200 Joules per square centimeter". The differences between a compressor blade and airfoil and a fan blade and airfoil are substantial and the Appellants have so stated and proven by pointing out that they are not considered substantially the same by those skilled in the art and in all of the references found to date. Furthermore, the Examiner ignored the fact that no reference teaches fan and compressor airfoils are substantially the same. The Examiner relied on his unfounded and unsupported conclusion that "It would have been obvious at the time the invention was made to a person having ordinary skill in the art to utilize the repaired laser shock peened gas turbine engine component of Mannava for the compressor blades as taught by Neal for the purpose of reducing compressor blade fatigue."

Neal et al. expressly states that normal shot peening damages the leading edge surface and teaches to lessen the blow by directing the shot at an oblique angle to a tangent of the surface. The Neal et al. reference discloses to use such an angle that is sufficient to cause oblique blows with

respect to a line normal to the surface where the shot stream hits and insufficient to cause direct impacts (see abstract in Neal et al.). This teaching of Neal et al., when taken with the rest of the whole of the prior art, clearly teaches one not to use the teaching in the Mannava 5,591,009 reference to peen an edge of a compressor airfoil.

The prior art does not teach direct shot peening of turbine blade edges and as evidenced by Neal et al. Laser shock peening uses a laser beam to produce a strong localized compressive force on a portion of a surface. The laser beam is fired through a curtain of flowing water that is flowed over a painted surface and the paint is ablated generating plasma which results in shock waves on the surface of the material. These shock waves produce forces that act normal to the surface of edges of the airfoil and, therefore, directly away from the teaching of Neal et al. which desires the impact of the shot, due to gravity shot peening, to be at a maximum oblique angle to the tangent of the edge surface which is designed to lessen the peening force to avoid deformation. Neal et al. clearly teaches directly away from both the Mannava '009 reference and the teaching of the present invention. Neal et al. clearly teaches and warns away from using a direct force normal to the surface being peened as is done in the present invention.

Nothing in the prior art discloses the combination of elements or even suggests making such a combination as the Examiner has done. The prior art does not disclose a compressor airfoil having a laser shock peened surface along a leading edge of the airfoil. The Examiner has failed to offer any references that refute the Applicants' position that one skilled in the art would not laser shock peen leading edges of compressor blades because of the understanding by those skilled in the art as evidenced by the warning in Neal that expressly states that normal shot peening damages the leading edge surface and teaches to lessen the blow by directing the

shot at an oblique angle to a tangent of the surface. One skilled in the art would read Neal and conclude that the shock waves from laser shock peening produce forces that act normal to the surface of edges of the airfoil and, therefore, directly away from the teaching of Neal et al. which desires the impact of the shot, due to gravity shot peening, to be at a maximum oblique angle to the tangent of the edge surface which is designed to lessen the peening force to avoid deformation.

#### HINDSIGHT

The Appellants respectfully submit the Examiner broke the invention into its constituent elements, found or improperly inferred each element of the invention in the prior art, and then claimed it would have been obvious for one of ordinary skill in the art to reassemble those elements into the invention. Such an analysis constitutes the forbidden hindsight reconstruction in analyzing obviousness, *In re Mahurkar*, Double Lumen Hemodialysis Catheter Patent Litigation, 831 F. Supp. 1354, 1374-75, 28 U.S.P.Q. 2d 1801 (N.D. Ill. 1993). The Appellants respectfully submit that it is well recognized in the law that a combination of prior art is improper and not obvious if the only suggestion or reason for combining the teachings of the prior art is to be found in the instant Application. *In re Pye & Peterson*, 148 U.S.P.Q. 426 (CCPA 1966). Furthermore, the fact that disclosures of references can be combined does not make the combination obvious unless the art also contains something to suggest the desirability of the combination. *In re Rinehart*, 189 U.S.P.Q. 143 (CCPA 1976); *In re Regal*, 188 U.S.P.Q. 136 (CCPA 1975); *In re Avery*, 186 U.S.P.Q. 161 (CCPA 1975); *In re Imperato*, 179 U.S.P.Q. 730 (CCPA 1973); and, *In re Andre*, 144 U.S.P.Q. 497 (CCPA 1965). The presently cited references do not disclose all the elements of the claims and fails to even suggest such a combination as mistakenly stated and concluded by the

Examiner.

To properly combine two references to reach the conclusion that the subject matter of an Application would have been obvious, the Examiner must point to teachings, suggestions or inferences in the references, or knowledge generally available to one of ordinary skill in the art of aircraft gas turbine engine compressor blades and vanes which would have lead such person to combine the relevant teachings of the references to obtain the result claimed by the Appellants. See A.C.S. Hospital Systems, Inc. v. Montefiore Hospital, 221 U.S.P.Q. 731, (Fed. Cir. 1984); W.L. Gore & Associates v. Garlock, Inc., 220 U.S.P.Q. 303 (Fed. Cir. 1983); and, In re Sernaker, 227 U.S.P.Q. 1 (Fed. Cir. 1983).

The Examiner has essentially stated that in his opinion fan and compressor airfoils are substantially the same; however, he has failed to rebut with evidence the argument made by the Appellants that such is not the case and that those skilled in the art would not make such a conclusion.

The test for obviousness is what do the references as a whole teach and not what a reference does not imply. Selective extraction of the teachings in a reference or references without regard for whether there is an objective basis for selection of those specific teachings, and whether the combination of those disparate teachings would render some or all of those teachings inoperable. See In re Mercer, 515 F. 2d 1161, 1165-66, 185 USPQ 774, 778 (CCPA 1975). In Bausch & Lomb, Inc. v. Barnes-Hind/Hydrocurve, Inc. (CA FC) 230 USPQ 416 (7/14/1986) the Court stated "It is impermissible within the framework of section 103 to pick and choose from any one reference only so much of it as will support a given position to the exclusion of other parts necessary to the full appreciation of what such reference fairly suggests to one skilled in the art.". This is precisely what the Examiner has done, he has ignored the fact that Neal warns away from direct shot peening in a direction normal to the surface similar to

the normal force produced by laser shock peening of the present invention. The Examiner has completely ignored the warning, the fact that none of the references teach shot peening or any other kind of peening of leading edges of compressor airfoils.

The Examiner, in applying Neal et al. in the 103 rejection of Claims 1-20, used the same prohibited selective extraction of the teachings and ignored the teaching of Neal et al. that warns away from using a direct force normal to the surface being peened as is done in the present invention with laser shock peening along the leading and trailing edges of compressor airfoils which clearly renders the Examiner's selectively extracted teachings inoperable. The Examiner has taken the limited type of peening disclosed in Neal totally out of context of the entire teaching of Neal, particularly, as it applies to laser shock peening in the presently Appealed Claims. Ignoring the warnings and limitations expressly taught in Neal is clearly the impermissible picking and choosing from one reference to the extent it will support a given position to the exclusion of other parts necessary to the full appreciation of what such reference fairly suggests to one skilled in the art. This is precisely the type of combination proscribed by the Court in Bausch & Lomb, Inc. v. Barnes-Hind/Hydrocurve.

The only suggestion or reason for combining the references is found in the Appellants' own disclosure which the Examiner has used as a blueprint to obtain the result claimed by the Appellants. The Appellants submit that this was an error as a matter of law, see W.L. Gore & Associates v. Garlock, Inc..

The Appellants respectfully submit that the Examiner's combination of prior art and subsequent rejections have been overcome by the arguments above and that the present claims are patentable over the combination of cited references because of the differences between the prior art and the

claims at issue. The prior art itself not only fails to teach a particular combination which results in the claimed invention, but also lacks various elements of the present invention, and the combination fails to show any purposes consistent with the present invention or reason why one skilled in the art should make the combination.

In summary, it is submitted that not one of the references or any combination thereof describes or suggests the Appellants' invention or how its benefits could be obtained. The Appellants respectfully submit that the Examiner has not shown the Appealed Claims 1-20 to be obvious, in light of the cited references, and asks that the Board overturn the Examiner's rejection of Claims 1-20 under 35 U.S.C. 103(a) as being unpatentable over Mannava '009, in view of Neal and Mallozzi 3,850,698, and allow all claims under Appeal.

ISSUE 2. -- Whether Claims 1, 2, 3, 4, 5, 6, 7, 8, 11, 12, 13, 16, 17, and 18 are patentable under the judicially created doctrine of obviousness-type double patenting as being unpatentable over Claims 1, 1, 3, 1, 3, 1, 1, 3, 1, 1, 3, 1, 1, and 3 of U.S. Patent No. 5,591,009 in view of Neal et al. 4,426,867 and Mallozzi 3,850,698.

ISSUE 3. -- Whether Claims 9-10, 14-15, and 19-20 are patentable under the judicially created doctrine of obviousness-type double patenting as being unpatentable over Claims 4, 4, 4, 4, 4, and 4, respectively, of U.S. Patent No. 5,591,009 in view of Neal et al. 4,426,867 and Mallozzi 3,850,698.

The argument for Issue 1 above applies to the judicially created doctrine of obviousness-type double patenting rejection in Issues 2 and 3 as well as regards the permissibility of applying Neal to the Mannava '009 and the

Mallozzi patent references. The Court in In re Berg, 46 USPQ 2d 1226 (CAFC 3/30/1998) held that obviousness-type double patenting is a judge-made doctrine that prevents an extension of the patent right beyond the statutory time limit. It requires rejection of an application claim when the claimed subject matter is not patentably distinct from the subject matter claimed in a commonly owned patent. Its purpose is to prevent an unjustified extension of the term of the right to exclude granted by a patent by allowing a second patent claiming an obvious variant of the same invention to issue to the same owner later. Such is not the case in the present Application under Appeal.

Claims in the Mannava '009 patent includes the limitations of a being a fan blade having a laser shock peened surfaces extending radially along a portion of and chordwise from the leading edge of an airfoil of the blade wherein the portion is centered about an intersection of the leading edge and a predetermined nodal line of the blade. The Appealed Claims of the present invention are directed at components having compressor airfoils and, therefore, are not fan blades. The Appealed Claims would not be infringed by articles covered by the claims in Mannava '009. It is also obvious from the arguments above that the Appealed Claims are patentably distinct from Mannava '009 in view of Neal et al. 4,426,867 and Mallozzi 3,850,698.

In summary, the Appellants submit that the issuance of Appealed Claims 1-20 would not be an extension of the patent right beyond the statutory time limit intended by Congress and that the Examiner has not shown the Appealed Claims 1-20 to be obvious, in light of the cited references. The Appellants submit that Claims 1, 2, 3, 4, 5, 6, 7, 8, 11, 12, 13, 16, 17, and 18 are patentable under the judicially created doctrine of obviousness-type double patenting as being unpatentable over Claims 1, 1, 3, 1, 3, 1, 1, 3, 1, 1, 3, 1, 1, and 3 of U.S. Patent No. 5,591,009 in view of Neal et al. 4,426,867 and

Mallozzi 3,850,698 and Claims 9-10, 14-15, and 19-20 are patentable under the judicially created doctrine of obviousness-type double patenting as being unpatentable over Claims 4, 4, 4, 4, 4, and 4, respectively, of U.S. Patent No. 5,591,009 in view of Neal et al. 4,426,867 and Mallozzi 3,850,698.

**ISSUE 4. -- Whether Claims 1-20 are patentable under the judicially created doctrine of obviousness-type double patenting as being unpatentable over Claims 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, and 1, respectively, of U.S. Patent No. 5,531,570 to Mannava since the claims, if allowed, would improperly extend the "right to exclude" already granted in the patent.**

The parent case of the Appealed Application and the U.S. Patent No. 5,531,570 of Mannava were filed on the same day. The Mannava '570 patent is different from the Appealed Application both in the claims and specification. The Mannava '570 patent and the Appealed Application have different inventive entities though some of the inventors are common to both the Appealed Application and the cited reference. The Appellants submit that the issuance of Appealed Claims 1-20 would not be an extension of the patent right granted beyond the statutory time limit intended by Congress as granted in the Mannava '570 patent. The term of the issued patent and any prospective patent that issues from the Appealed Application will expire on the same date, 20 years from the filing of the parent Application of the Appealed Application and of the Mannava '570 patent.

The Court in *In Re Berg*, supra, discloses there are narrow exceptions to the application of the generally accepted "one-way" test that has been applied to determine obviousness-type double patenting. The exception referred to as the "two-way" test was not applied by the Examiner in this

Rejection. The Appellants submit that the two-way test should be applied and that for policy reasons there is no reason to issue a rejection based on the judicially created doctrine of obviousness-type double patenting because both the issued patent and any patent that issues from the Appealed Application will have the same expiration date. The patent and the Appealed Application address two different but admittedly related problems.

The Board in the Berg case held that "the term of patent protection for the best mode would be unjustifiably extended beyond the statutory time limit by allowance of the herein appealed claims." Furthermore, the Appellants submit that unlike in the Berg case, the specification of the Appealed Application is different than that of the '570 patent. Not only are they not identical but the two disclosures are not alike. The invention in the '570 patent is not disclosed in the Appealed Application and, therefore, the Examiner should have applied the two-way test.

Under the two-way test, the Examiner should determine whether the patents are obvious over the application claims. If the Examiner finds that they are not, the application claims should be allowed. Thus, when the two-way test applies, some claims may be allowed that would have been rejected under the one-way test. Since nothing is mentioned in the Appealed Application regarding counter distortion means and techniques included in the claims of the '570 patent, the claims of the patent are not obvious over the Appealed Application. Therefore, under the two-way test Claims 1-20 should not be rejected for obviousness-type double patenting.

In summary, the Appellants submit that the issuance of Appealed Claims 1-20 would not be an extension of the patent right beyond the statutory time limit as intended by Congress and that Claims 1-20 are patentable under the judicially created doctrine of obviousness-type double patenting over

Claims 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, and 1, respectively, of U.S. Patent No. 5,531,570 to Mannava since the claims, if allowed, would not improperly extend the "right to exclude" already granted in the '570 patent.

Respectfully submitted,

A handwritten signature in cursive script, reading "Steven J. Rosen", is written over a horizontal line.

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July 15, 1999

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APPENDIX A (37 C.F.R. 1.192(c)(7))

1. A gas turbine engine component comprising:
  - a metallic compressor airfoil having a leading edge and a trailing edge and a pressure side and a suction side,
  - at least a first laser shock peened surface on a first side of said airfoil,
  - said laser shock peened surface extending radially along at least a portion of said leading edge and extending chordwise from said leading edge, and
  - a first region having deep compressive residual stresses imparted by laser shock peening (LSP) extending into said airfoil from said laser shock peened surface wherein said deep compressive residual stresses are formed with focused laser beam spots on said laser shock peened surface, the laser beam spots having a power density in a range between 100 and 200 joules per square centimeter.
2. A component as claimed in claim 1 further comprising:
  - said first laser shock peened surface located along said pressure side of said leading edge,
  - a second laser shock peened surface located along said suction side of said leading edge and extending radially along at least a portion of said leading edge and extending chordwise from said leading edge, and
  - a second region having deep compressive residual stresses imparted by laser shock peening (LSP) extending into said airfoil from said second laser shock peened surface wherein said deep compressive residual stresses are formed with focused laser beam spots on said laser shock peened surface, the laser beam spots having a power density in a range between 100 and 200 joules per square centimeter.
3. A component as claimed in claim 2 wherein said laser shock peened regions extending into said airfoil from said laser shock peened surfaces are formed by simultaneously laser shock peening both sides of said airfoil.
4. A component as claimed in claim 2 further comprising:
  - third and fourth laser shock peened surfaces extending radially at least along a portion of said trailing edge and extending chordwise from said trailing edge on said pressure and suction sides respectively of said airfoil,
  - a third laser shock peened region having deep compressive residual stresses imparted by laser shock peening (LSP) extending into said airfoil from said third laser shock peened surface, and
  - a fourth laser shock peened region having deep compressive residual stresses imparted by laser shock peening (LSP) extending into said airfoil from said fourth laser shock peened surface.

5. A component as claimed in claim 4 wherein said third and fourth laser shock peened regions extending into said airfoil from said laser shock peened surfaces are formed by simultaneously laser shock peening both sides of said trailing edge of said airfoil.

6. A gas turbine engine compressor blade comprising:  
a metallic compressor blade airfoil having a leading edge and a trailing edge and a pressure side and a suction side,  
at least a first laser shock peened surface on a first side of said airfoil,  
said laser shock peened surface extending radially along at least a portion of said leading edge and extending chordwise from said leading edge, and  
a first region having deep compressive residual stresses imparted by laser shock peening (LSP) extending into said airfoil from said laser shock peened surface wherein said deep compressive residual stresses are formed with focused laser beam spots on said laser shock peened surface, the laser beam spots having a power density in a range between 100 and 200 joules per square centimeter.

7. A compressor blade as claimed in claim 6 further comprising:  
said first laser shock peened surface located along said pressure side of said leading edge,  
a second laser shock peened surface located along said suction side of said leading edge and extending radially along at least a portion of said leading edge and extending chordwise from said leading edge, and  
a second region having deep compressive residual stresses imparted by laser shock peening (LSP) extending into said airfoil from said second laser shock peened surface wherein said deep compressive residual stresses are formed with focused laser beam spots, on said laser shock peened surface the laser beam spots having a power density in a range between 100 and 200 joules per square centimeter.

8. A compressor blade as claimed in claim 7 wherein said laser shock peened regions extending into said airfoil from said laser shock peened surfaces are formed by simultaneously laser shock peening both sides of said airfoil.

9. A compressor blade as claimed in claim 8 wherein said compressor blade is a repaired compressor blade.

10. A compressor blade as claimed in claim 6 wherein said compressor blade is a repaired compressor blade.

11. A gas turbine engine compressor blade comprising:  
a compressor blade metallic airfoil having a leading edge and a trailing edge,

at least a first laser shock peened surface on at least one side of said airfoil,

said first laser shock peened surface extending radially at least along a portion of said trailing edge and extending chordwise from said trailing edge, and

a first region having deep compressive residual stresses imparted by laser shock peening (LSP) extending into said airfoil from said first laser shock peened surface wherein said deep compressive residual stresses are formed with focused laser beam spots on said laser shocked peened surface, the laser beam spots having a power density in a range between 100 and 200 joules per square centimeter.

12. A compressor blade as claimed in claim 11 further comprising:

said first laser shock peened surface located on a pressure side of said airfoil,

a second laser shock peened surface extending radially at least along a portion of said trailing edge and extending chordwise from said trailing edge on a suction side of said airfoil, and

a second region having deep compressive residual stresses imparted by laser shock peening (LSP) extending into said airfoil from said second laser shock peened surface.

13. A compressor blade as claimed in claim 12 wherein said laser shock peened regions extending into said airfoil from said laser shock peened surfaces are formed by simultaneously laser shock peening both sides of said trailing edge of said airfoil.

14. A compressor blade as claimed in claim 13 wherein said compressor blade is a repaired compressor blade.

15. A compressor blade as claimed in claim 11 wherein said compressor blade is a repaired compressor blade.

16. A gas turbine engine compressor blade comprising:

a compressor blade metallic airfoil having pressure side, a suction side, a leading edge, and a trailing edge,

a first laser shock peened surface extending radially at least along a portion of one of said edges on a side of said airfoil extending radially along and chordwise from said one of said edges,

a second laser shock peened surface extending radially at least along a portion of the other one of said edges on a side of said airfoil extending radially along and chordwise from said other one of said edges, and

first and second regions having deep compressive residual stresses imparted by laser shock peening (LSP) extending into said airfoil from said first and second laser shock peened surfaces respectively along said leading and trailing edges of

said airfoil wherein said deep compressive residual stresses are formed with focused laser beam spots on said laser shock peened surfaces, the laser beam spots having a power density in a range between 100 and 200 joules per square centimeter.

17. A compressor blade as claimed in claim 16 further comprising:

a third laser shock peened surface located opposite said first laser shock peened surface such that said first and third laser shock peened surfaces are located along pressure and suction sides of said leading edge respectively,

a third region having deep compressive residual stresses imparted by laser shock peening (LSP) extending into said airfoil from said third laser shock peened surface,

a fourth laser shock peened surface located opposite said second laser shock peened surface such that said second and fourth laser shock peened surfaces are located along pressure and suction sides of said trailing edge respectively, and

said third and fourth regions having deep compressive residual stresses imparted by laser shock peening (LSP) extending into said airfoil from said third and fourth laser shock peened surfaces respectively.

18. A compressor blade as claimed in claim 17 wherein said laser shock peened regions extending into said airfoil from said laser shock peened surfaces are formed by simultaneously laser shock peening both sides of said leading edge of said airfoil and by simultaneously laser shock peening both sides of said trailing edge of said airfoil.

19. A compressor blade as claimed in claim 18 wherein said compressor blade is a repaired compressor blade.

20. A compressor blade as claimed in claim 16 wherein said compressor blade is a repaired compressor blade.